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WATER CONSERVATION/EDUCATION

To guide the management of water development projects, the Board of Water Resources has issued a policy statement which supports conservation and the wise use of water. It states that water conservation will be examined as an alternative and a supplement to project proposals.

17.1 Introduction

This section discusses water conservation needs, issues, and potential alternatives, plus gives some recommendations for conserving water. Water conservation is defined in the *State Water Plan* as "wise use," which is much wider in scope than merely reducing water consumption. State water policy on conservation presently requires project sponsors seeking financial assistance from the state to prepare a *Water Management and Conservation Plan*.

Significant water use reductions can and have been achieved when people understand the reasons to conserve, especially in times of drought. It must be remembered, though, that reducing demand for water is less important if there are no cost savings or if the water cannot be used for other desirable purposes. However, in today's environmental-conscious



Students see water close-up at water fairs

society, implementing water conservation is deemed "the right thing to do."

Water conservation can be pursued through three strategies: (1) Reducing the demand, (2) using the existing supply more efficiently, and (3) increasing the supply by operating the storage and delivery facilities more efficiently (including the elimination of conveyance losses), or through other means.

Examples of (1) are increasing crop irrigation efficiency, restricting outside use, change in landscaping practices, new efficient plumbing fixtures (i.e. low flow toilets and low flow shower nozzles), pricing and water education. Examples of (2) are secondary (dual) systems, wastewater reuse, water right transfers and conjunctive use. Examples of (3) are repairing and lining canals, leak detection programs and efficient release of water from storage facilities. All of these strategies are valid in the Jordan River Basin. Structural and non-structural measures apply to each.

17.2 Background

As determined by the Wasatch Front Water Demand/Supply Model, (See Table 17-1 and Table 9-4) the average annual diversion (1995) for municipal and industrial (M&I) water in Jordan River Basin was 331,500 acre-feet. This present M&I use is comprised of three components: a residential use of 164,600 acre-feet, a commercial/institutional use of 77,200 acre-feet and an industrial use of 15,400 acrefeet. Given the current population trends and existing water-use patterns, residential demand is expected to increase to 261,500 acre-feet by the year 2020. The commercial/ institutional use is projected to increase to 135,000 acre-feet by the year 2020. Institutional water uses include such items as park watering, fire hydrant testing, fire fighting and leakage losses. The industrial use is expected to increase to 25,300 acrefeet by he year 2020. Consequently, if existing wateruse patterns go unchanged, the existing total M&I use for Salt Lake County is expected to increase from 331,500 acre-feet in 1995 to 496,500 acre-feet in the year 2020.

The average annual irrigation diversion needs (1995) for the Jordan River Basin are 126,500 acrefeet. Due to the growing residential development and declining amount of agricultural land, it is anticipated that irrigation diversions and depletions will decrease to 71,000 acre-feet by the year 2020. (See Section 10)

17.3 Water Conservation Opportunities

The 1992 Central Utah Project Completion Act (CUPCA) requires 39,325 acre-feet of water conservation within the project service area by the year 2007. The CUPCA authorized the appropriation of \$50 million of federal funds for conservation measures. To date, less than \$4 million has been appropriated. This money is available on a 65-35 percentage cost share with the 65 coming from project funds.

This section includes a discussion of municipal and industrial (M&I) conservation and agricultural water conservation practices. Agricultural water is untreated water, usually of poorer quality used specifically for production of crops. By definition, M&I refers to all public water use. Therefore, untreated "secondary" water is included in the broad category of municipal and industrial water. The vast majority of M&I water is treated culinary water as a part of the public water systems. It is used for residential, commercial and industrial purposes, and is treated to meet the strict regulations of its highest use - drinking water. Consequently, M&I water is expensive, especially when compared with the price of agricultural water. Obviously, water conservation strategies for these two different types of water use are varied.

17.3.1 Agricultural Water Conservation

A land use inventory for Salt Lake Valley completed in 1994 determined irrigated agricultural lands covered 25,300 acres. The current water rights allotment is five acre-feet per acre. This means approximately 126,500 acre-feet of water are diverted annually for agricultural irrigation. Of the five acrefeet duty (allotment), about 2.3 acre-feet per acre is used for crop consumption. The remaining 2.7 acrefeet per acre is for conveyance and application losses.

Clearly, there is potential to conserve agricultural irrigation water. Irrigation diversions can be reduced by eliminating conveyance losses such as canal seepage, and improving irrigation scheduling during the growing season. Canal operation and maintenance is a constant activity of irrigation companies. Sprinkler irrigation may improve onfarm efficiencies. But studies have shown that Utah Lake water, when sprinkled on leaves, creates a salt toxicity danger to crops. In addition, decreasing the Utah Lake duty on farmlands reduces the flushing in the root zone, which can create a salt toxicity build-up and damage crops.

Although there is a real potential to conserve Jordan River irrigation water, there is no real incentive to do so. As pointed out in previous sections (See sections 5, 7 and 10 for details), there is sufficient agricultural irrigation water supply for the existing demand. There is no foreseeable need for additional agricultural water. Also, because Jordan River water quality is poor, it is not presently economically feasible to treat it for municipal use.

17.3.2 Municipal and Industrial Water Conservation

Conservation of municipal and industrial water is an appropriate and feasible way to meet part of the future water requirements. However, satisfying all of the projected growth through conservation is not possible. The county population is projected to increase about 62 percent (495,100 people) by the year 2020 (See Section 4). Coupled with the current water consumption rate, this projected growth will increase the M&I water demand from 331,500 acrefeet to 496,500 acrefeet by the year 2020. This increased water demand will most likely be met through a combination of actions including water conservation, new wells, water import from outside the basin, and treating additional surface water.

Some effective water conservation measures could be employed to significantly reduce municipal water use. Unmetered water use and system losses amount to 21,400 acre-feet. This figure is projected to increase to about 40,000 acre-feet over the next 25 years. Although the unmetered uses include fire fighting and park watering, the potential still exists for conserving residential water through maintenance and monitoring. The city of West Jordan recently computerized its lawn watering system for 150 acres of parks, cemeteries and recreational areas. The city

Table 17-1 PRESENT AND PROJECTED MUNICIPAL AND INDUSTRIAL WATER USE							
Water-use	1995 (acre-feet)	2020 (acre-feet)					
Residential	164,600	261,500					
Commercial/Institutional ^a	77,200	135,000					
Industrial	15,400	25,300					
Private Domestic	24,600	20,000					
Self-Supplied Industrial	26,500	26,500					
Secondary: Municipal	10,000	15,000					
Industrial	13,200	13,200					
Total M&I	331,500	496,500					

estimates it saves 75 acre-feet of water annually. For West Jordan parks, that represents a water savings of about 20 percent over the past few years.

Consequently, programs that improve efficiency of large landscaping systems can have a positive impact on water consumption.

Residential Water Conservation - Residential water in Salt Lake Valley can be conserved in a number of ways. Water-efficient appliances such as low flow toilets and shower heads are only required in new construction. And most wholesale and retail price structuring provide little incentive for water conservation. The most inefficient use of residential water is over-watering of lawns and gardens. Education coupled with price incentives could accomplish a lot in terms of conserving residential water.

Commercial Water Conservation - Opportunity for water conservation in the commercial sector is limited. Studies suggest that commercial users are no less efficient than other industrial water users. In fact, some commercial endeavors, such as laundries, have already implemented water conservation to reduce energy costs. It is likely, however, water pricing incentives and pretreatment wastewater requirements would further motivate commercial businesses (users) to re-evaluate their water conservation efforts.

Industrial Water Conservation -

Approximately half of the basin's industrial water is taken from public water systems with the balance coming from private sources. This is primarily because the largest industrial water user, Kennecott Utah Copper, has a self-supplied water system and an extensive water recycling program. Water pricing

incentives will likely have a positive impact upon industries which receive water from public water systems.

17.4 Conservation Methods and Strategies

A wide range of water conservation methods have been employed in various regions of the country. The lessons learned in other states can be useful to Utah. However, it should be kept in mind the expected outcome can be affected by differing circumstances.



Wasteful municipal water use is costly

The following paragraphs provide a brief description and discussion of the conservation methods and

strategies expected to produce the most favorable impact in the Jordan River Basin.

17.4.1 Wastewater Reuse

One effective method of conserving existing water supplies would be to establish a system of reuse. To some extent, current water supplies are reused as return flows from irrigation fields and effluent from wastewater treatment plants return into the Jordan River. These supplies are re-diverted and reused downstream for additional agricultural or wildlife uses.

No direct reuse or recycling of wastewater for drinking water use has been universally accepted in the United States, except in emergency situations. However, reuse of wastewater for industrial, agricultural and other uses, such as golf course watering, is becoming more common. In the future, water reuse may become a more valuable tool in conserving the existing water supply.

The reuse of Central Valley Wastewater
Treatment Plant (CVWRF) effluent for agricultural
uses has been considered. This proposal would pump
effluent from the plant to the south end of the valley
where it would be discharged into existing irrigation
ditches and co-mingled with irrigation water supplies.
The water currently being diverted for irrigation could
then be left in Utah Lake. Project proponents have
been the SLCWCD, CUWCD, and CVWRF. The
plan, however, was found to be economically
infeasible, and further studies and EIS work were
discontinued. This plan, which is on hold while
further evaluations are made, may be inconsistent
with the current trend of farm land rapidly being
converted to residential property.

17.4.2 Public Information/Education

Since everyone is a water user, any significant gain in conservation is an accumulation of individual attitudes and efforts. Therefore, public education is essential in conserving water. The degree of success will be directly proportional to the public perception of the need for water conservation. Every public agency or private organization concerned with planning, developing or distributing water can make a difference through efforts in this regard. Water conservation material is currently being mailed to schools, water-user organizations and individuals (on request). These materials are part of a water education program by the Division of Water

Resources. Other conservation objectives of the division's education program include water-efficient landscaping and gardening techniques and conversion to more efficient appliances such as low flush toilets and low flow showerheads.

Educational programs continue to be carried out with students in elementary and secondary schools assisted by the International Office of Water Education at Utah State University and Project Wet, a consortium of water education agencies throughout the United States. Successful "Water Fairs" were held in 1994 and 1996 at the Salt Lake Community College (SLCC) for students in Jordan, Salt Lake, Murray, and Granite School districts. At SLCC, students are actively involved in half-day workshops where water-related topics are taught by professionals from water-related organizations.

17.4.3 Institutionalizing Water Conservation

An effective water conservation program requires a cooperative effort by all segments of the public. One way to achieve this would be through an active water education program conducted by public water utilities.

Other efforts include the Utah Water Conservation Forum organized in 1993. This non-profit organization is comprised of concerned individuals and groups throughout the state whose long-range goal is to become more aware of the importance of managing, preserving and learning practical ways of incorporating water conservation into every part of their lives. Meeting quarterly, the forum has educational presentations about water conservation, including water-wise landscaping. The forum also serves as a clearinghouse where highly trained professionals evaluate new products, programs and concepts. Most attendees are from Salt Lake County.

Another interesting example are the results in California from a persistent five-year drought. Severe water shortages were experienced throughout the state. Water conservation, as well as re-allocation of supplies, was an absolute necessity. Conservation is now formally recognized as an important long-term component of water management and future growth. Dozens of cities and several public interest groups have signed a unique agreement called the Memorandum of Understanding Regarding Urban Water Conservation. "The pact commits the signatories to a multimillion dollar effort to reduce

water consumption whether the weather is wet or dry." Program participants represent about 90 percent of the state's urban population. Savings of 500,000 acre-feet by the year 2000 and 1,000,000 acre-feet by the year 2010 are estimated. A series of "best management practices" in the program include public information campaigns, school education programs, water audits for houses, new and retrofit plumbing to increase the use of efficient showerheads and toilets, and conservation pricing. These efforts are expected to use current supplies more fully in the future as the population grows. But in spite of the anticipated water savings, new water supplies will also be needed. One of the significant findings of the above efforts is that, "...by promoting greater conservation, many cities may become increasingly vulnerable to future droughts because there won't be a margin of safety in water use. This makes development of additional reliable supplies even more important."

17.4.4 Restricting Water Use

To make enough water available for necessary household and commercial use during periods of severe drought, the use of municipal water for lawn and garden watering and other outside uses has periodically been restricted in Utah as in 1977. One of the easiest restrictions to monitor and enforce is to prohibit outside use during times of the day or days of the week. In the most severe cases, all outside use has been temporarily prohibited. The public has accepted these restrictions when they understand the necessity and realize the situation is temporary. But it is doubtful the public would accept such restrictions if they are perceived to be unnecessary or artificially contrived.

Because of the loss of water to evaporation on hot summer days, some water districts prohibit lawn watering between the hours 10 a.m. to 6 p.m. The estimated loss from evaporation during the day is 10 to 15 percent of the applied water. Programs restricting the use of secondary water during daytime summer hours have been established by several cities. Water suppliers consider this program a large success and it has been well received by customers. Restriction of daytime watering is a recommendation of the Utah Water Conservation Advisory Board and could be implemented in the Jordan River Basin.

At the present time, the greatest threat imposed during extended hot, dry periods is not inadequate supply but rather a deficient infrastructure which is incapable of delivering a flow sufficient to meet peak demand. Consequently, during hot summer days, demand can result in insufficient flows, low water pressure, inadequate fire flow capacity, and back-syphoning or negative pressures that can cause structural damage to the system. Experience has shown outside watering restrictions to be an effective tool in reducing peak demand. In fact, even when watering restrictions have failed to reduce the total water use, they have still proven effective in reducing peak demand. Consequently, water purveyors will continued to implement outside watering restrictions or other measures to help deal with peak demand.

17.4.5 Conjunctive Use

Conjunctive use of water supplies (also called "joint use") most often refers to surface water and groundwater. Where both are available as a water supply, groundwater can be allowed to accumulate during wet years, and then pumped in dry years to supplement surface water supplies. This is an excellent example of wise use because it manages the total water supply, maximizing system efficiency.

Similarly, treated and untreated water can be used jointly to conserve water as well as reduce costs. A secondary system to distribute untreated water for lawns and gardens allows use of a smaller system capacity of expensive treated water. A substantial portion of high-quality treated water in public systems is customarily used for lawn and garden watering.

17.4.6 Landscaping and Home Water Savings

Reductions in per capita use of municipal water requires changes in personal habits and traditional practices inside and outside the home. This requires a public perception of need, but it can produce significant savings.

- Inside, users can install water-saving toilets and shower heads, check plumbing for leaks, take shorter showers, use automatic dishwashers and washing machines only for full loads, and avoid having faucets run long periods for shaving or rinsing vegetables, dishes and other items.
- Outside, users can avoid using a hose to clean driveways and stop letting water run constantly while washing a car. Landscaping practices can also be improved. The Division of Water Resources teaches and encourages

the installation and planting of water conserving landscaping. The principles include limiting lawn areas, using plants and trees with low water requirements, irrigating only when needed, watering during morning or evening hours, and improving soils in shrub and garden areas by using mulches.

17.4.7 Pricing

Pricing policies are suggested as a means of reducing per capita water use. Flat rates (same price for each unit of water) provide little incentive for consumers to conserve. Decreasing block rates (lower unit prices for larger volume) provide even less conservation incentive. "Take or pay" contracts, which provide water purveyors with the guaranteed revenue stream needed for bonding, do not promote any conservation below the contracted amount. Increasing block rates provide the greatest conservation incentive for consumers. Under this pricing policy, consumers experience an increasing unit price for higher water consumption. To be effective, the increasing block rate must be substantial and would probably require strong public support.

Beginning July 1, 1995, Salt Lake City
Corporation implemented seasonal rates for its water customers. This new rate strategy cuts water rates for eight months during the spring, winter and fall, when water is plentiful. Water rates increase during the four months of summer when the cost of delivery increases because of high demand for outside watering. Titled the "Summer-Efficiency Rate," this rate restructuring is designed to be revenue-neutral and is intended to delay building new aqueducts and treatment plants. If successful, similar plans could be adopted by other water purveyors in the Jordan River Basin and throughout the state.

In November 1994, Kearns Improvement District initiated a progressive water rate structure for residential and municipal water users. For the first 10,000 gallons of water residential users are charged 90 cents per thousand gallons. The rate is then increased by 10 cents per thousand gallons with each additional 10,000 gallons of use. In other words: \$1.00 per thousand gallons for the second 10,000 gallons of use, \$1.10 per thousand gallons for the third 10,000 gallons, etc. The district has also established an increasing block rate for users that irrigate large lawn parcels. These irrigators are allotted 120 percent of the amount of water necessary

to grow Kentucky Bluegrass, at \$1.00 per thousand gallons. Anything exceeding that allotment is charged at \$1.50 per thousand gallons. It has been estimated that although this program offers relatively inexpensive water at the lower block rate, it has been well received and resulted in a decrease in water use of 13 to 15 percent.

17.4.8 Water Measurement

Accurate measurement of water encourages water conservation in several ways. Not only is each user assured of fair and equitable distribution and financial assessments, it is also a more business-like way to operate a system and provide records. Where users pay according to the quantity of water they actually use, there is a built-in incentive to conserve, whether the use is irrigation, municipal or industrial. Most community water systems are metered. Properties like city parks, golf courses and cemeteries, however, do not have meters.

17.4.9 Secondary or "Dual" Systems

Secondary water systems, also known as "dual" water systems, provide untreated water of moderate quality for outdoor uses, primarily lawn-watering and gardening. Because these systems require the construction of an additional water conveyance infrastructure, they can be expensive. However, secondary water systems are economical if the construction costs are less than the cost of enlarging the M&I system to meet future needs and the costs associated with treating the water to drinking water standards. While there may be an economic incentive for building secondary water systems based on the cost of high quality treated water conserved, studies have shown that "secondary" systems do not promote overall water conservation. Since secondary water is less expensive than treated water and is seldom metered, consumers tend to use more of it when watering their lawns. Only a few secondary water systems are in place in the Jordan River Basin. Since retrofitting can be expensive, it is doubtful many new secondary water systems will be constructed in existing communities. In areas of new construction where an adequate secondary water supply exists, secondary systems may prove economical. Construction of these systems allows the use of lower quality (untreated) water on lawns and gardens freeing up the existing developed high quality water for meeting growth.

17.5 Water Conservation Impacts

The Wasatch Front Water Demand/Supply Model (WFCM) was used to project future demands with current conservation trends in Salt Lake County. Four individual scenarios and one combined scenario were made as follows:

- 1) Baseline for comparison no conservation
- 2) Indoor conservation (low flow plumbing)
- 3) Outdoor conservation (water efficient landscaping)
- 4) Economic conservation (10 percent price increase in addition to inflation)
- 5) Combination of measures 2, 3 and 4.

Projected demand and the percentage reduction (or increase) due to various measures for the years 2000, 2010 and 2020 are shown in Table 17-2.

The plumbing conservation measure showed an increasing percentage reduction from base case projections over time as the fraction of the population using the new water efficient fixture increases. The percent reduction in the Jordan River Basin increases from 2.3 percent in the year 2000 to 7.2 percent in the year 2020.

Water conservation landscaping showed increasing water savings over time but the effect is minor. By the year 2020, the reduction of water use is projected to be 1.9 percent. This could be increased significantly without a major change of water use to irrigate lawns. Studies show people use 30-40 percent more water on their lawns than is necessary.

The 10 percent price increase simulation showed a nearly constant drop in demand of 2.60 percent. The combined effect of plumbing, water efficient landscaping and price increase results in a year 2020 savings of 11.4 percent. The combined effect of these

conservation measures is only slightly less than the sum of these individual measures.

17.6 Water Conservation Credit Program

The purpose of the Central Utah Project Water Conservation Credit Program is to identify, evaluate and prioritize water conservation projects included in the *Water Management Improvement Plan*. The Central Utah Water Conservancy District will evaluate the effectiveness of the conservation credit program on an annual basis, and may adjust any section as necessary. Project requirements and valuations will not differ between proposed projects in any given period when two or more projects are being compared. The goal of the program is to conserve 39,325 acre-feet of water annually. Up to 65 percent of costs for each project accepted by the district may qualify for federal grants. The remaining 35 percent must come from local or state funds.

The district or a petitioner may retain any water they conserve to meet future uses or the petitioner may make saved water available to the Secretary of the Interior to be used as instream flows for the benefit of fish and wildlife. The secretary shall reduce the annual contractual repayment obligation of the district if this happens. The reduction will be equal to the project rate for delivered water, including operation and maintenance expense, for water saved for instream flow.

The district shall credit or rebate to each petitioner its proportionate share of the savings. This program contains several elements to provide a systematic approach to the accomplishment of these purposes and an objective basis for measuring their achievement. It allows the district to identify, evaluate, fund and carry out the conservation measures required to meet the district's goals.

Table 17-2 IMPACTS OF CONSERVATION ON M&I WATER DEMANDS										
Year	1995	2000	2010	2020	2000	2010	2020			
Conservation Scenarios: Demand (Acre-feet/year)					Percent Change					
Base Case	255,737	279,572	345,573	419,316	9.32	35.13	63.96			
Plumbing		273,075	327,455	388,913	-2.32	-5.24	-7.25			
Xeriscaping		279,205	342,722	411,483	-0.13	-0.83	-1.87			
Price+10%		272,299	336,548	408,450	-2.60	-2.61	-2.59			
Combination (2-4)		265,670	316,341	371,613	-4.97	-8.46	-11.38			
Source: Wasatch Front Water	er Demand/Supply	Model, Novemb	per 1996	-						

Any person, group or organization with an idea for a project that conserves water may apply to participate in the Credit Program. Not all projects submitted will be selected for funding and implementation. All projects must complete all elements listed in the water conservation credit program document dated July 1993. A copy may be obtained from the Central Utah Water Conservancy district.

17.6.1 Public Education

Public education is recognized as an integral part of any conservation program. The purpose is to reduce the demand for water through education. With people educated about water and its many values, they will be better prepared to make decisions about efficient water use, conservation methods, water saving techniques and development opportunities. Education projects and programs approved under the credit program are also eligible for 65 percent funding with federal grant monies.

17.6.2 Utah Water Conservation Advisory Board

The Central Utah Project Completion Act (CUPCA) allowed the governor to establish a board consisting of nine members, known as the Utah Water Conservation Advisory Board. The Utah Board of Water Resources was designated to be the new board with the addition of one member from the environmental community. The duty of the board included investigating specific water conservation strategies and then developing water conservation standards and regulations aimed at reducing water demand. These standards and regulations were then recommended for promulgation by state or local authorities in the service area of each petitioner of project water.

Complete findings and recommendations are published in a report titled *Recommendations for Water Conservation Standards and Regulations in Utah.* The findings and recommendations of the Water Conservation Advisory Board are incorporated into subsection 17.3, Water Conservation Opportunities; subsection 17.4, Conservation Methods and Strategies; and subsection 17.7, Issues and Recommendations

17.6.3 Water Conservation Pricing Study

Under the CUPCA, the district studied wholesale and retail pricing as a means of encouraging water

conservation. The *Report on Water Pricing Policy Study* was published in October 1995. This study focused on various pricing mechanisms to conserve water. The purposes of the study are to:

- A) Design and evaluate potential rate designs and pricing policies for water supply and wastewater treatment within the district boundary;
- B) Estimate demand elasticity for each of the principal categories of end use of water within the district boundary;
- C) Quantify monthly water savings estimated to result from the various designs and policies to be evaluated; and
- D) Identify a water pricing system that reflects the incremental scarcity value of water and rewards effective water conservation programs.

The study examined policies for irrigation water pricing, wastewater pricing, wholesale and retail pricing, and conservation pricing. The experiences of other water-constrained communities were also examined. The rate structures evaluated include: uniform rates, seasonal rates, drought year surcharges, increasing block rates, ratchet rates, marginal cost pricing and goal based rates. The study pointed out that changes in pricing policies are likely to gain greater public acceptance if they are phased in over time.

17.7 Issues and Recommendations

17.7.1 Water Pricing Incentives

Issue - Low water costs do not promote conservation

Discussion - Water pricing can be an effective tool in promoting water conservation by providing an incentive to decrease water consumption. Many water pricing structures currently incorporate a constant volume with the basic rate and constant overage charges for use above this rate. If rates are very low, water users will not feel the need to carefully use water because cost seems insignificant.

Some water providers fear that raising rates will decrease water sales and thus decrease revenues for